munications with reference to the conference should be addressed to the hon. secretaries, Mr. Alfred Goddard and Mr. F. H. Pruen, Education Offices, Northumberland Road, Newcastle.

SEVERAL changes have taken place, we learn from *Science*, in the staff of the research laboratory of physical chemistry of the Massachusetts Institute of Technology. Prof. W. D. Coolidge has accepted a position in the technical research laboratory of the General Electric Company at Schenectady. To Prof. Coolidge has been due in large measure the development of one of the most important lines of work in progress in the research laboratory of the institute—the investigation of the conductivity of aqueous solutions at high temperatures. Mr. Yogoro Kato, who has also been engaged on the conductivity investigation for two years, has accepted a position in the Technical High School of Tokio, where he will have charge of the work in electrochemistry. Dr. Wilhelm Böttger will return as privatdocent to the University of Leipzig, at which he will conduct one of the laboratory courses in analytical chemistry. In place of these retiring members, Messrs. William C. Bray, Guy W. Eastman, Gilbert N. Lewis, and Edward W. Washburn have been appointed to the research staff.

AT the distribution of prizes to the students of the Mechanics' Institute, Crewe, on November 22, Sir Oliver Lodge delivered an address. He emphasised the importance of the study of pure science and the application of its broad principles, whereby it is possible to make discoveries and to ascertain facts which are not known to the human race. After all the ages of the human race there are innumerable facts which we do not know, and it is now and then given to a man here and there to find them out and pass them on as common property never more to be lost. Sir Oliver Lodge went on to say he does not believe that a thing which really exists can go out of existence. There is an infinitude before us, and it behoves us to realise that and see to it that we fit ourselves for what is to come. We are parts of an industrial organism, parts of a much larger organism, the universe, and in the universe there is one great law of evolution, of growth, and development. The universe is not yet perfect; it is our privilege to help in the process of making it more perfect. Things will not be done on this planet unless we help to do them; we are agents for helping in the process of evolution. Errors or mistakes may cause dislocation or calamity in the great scheme. We have the power of causing dislocation or calamity by errors, or by living strenuous self-sacrificing lives we have the power of cooperating in the great scheme of helping towards the fruition, development, growth, and progress of the universe of which we are an infinitesimal part.

THE inaugural address delivered by Dr. B. C. A. Windle, F.R.S., president of Queen's College, Cork, at the opening of the session, is given the first place in the current number of the *University Review*. Dr. Windle deals in an exhaustive manner with the subject of examinations in Ireland and with the university question. Four deadly errors, he maintains, have long affected England and Ireland. These errors are that acquisition of knowledge and education are synonymous terms; that education—as apart from mere knowledge—can be easily, nay, more, can only be tested by examination; that a degree is in itself an object of value; and that a degree means the same however and wherever it may have been acquired. Dr. Windle regards examinations as an evil, but at present a necessary evil, and proceeds to discuss the objects such examinations should have in view. By means of an examination, Dr. Windle explains, an endeavour is made to ascertain whether the candidate has acquired the necessary knowledge of facts to enable him to proceed to a further stage of learning or—at the end of his course—a sufficient knowledge of his profession to be trusted to go out into the world and practise it independently. An examination is intended, moreover, to ascertain whether a student has acquired the proper methods of gaining and applying knowledge. To secure efficient examinations, the article lays it down, every teacher should take a large share in any examination which his students may have to confront, but the judgment of the teacher should be supported or corrected by the assistance of an external examiner. The conclusion of the article is that there is at present in Ireland, for the great majority of its inhabitants, "a university system which almost necessitates a method of examination which is harmful in its effects on education; a method which leads to subterranean complaints and accusations, which, though they may be, and almost invariably are, false, are none the less injurious to education generally; a method for which, indeed, no excuse can be urged except the excuse that the system arises out of the necessities of a position which never ought to have been created."

SOCIETIES AND ACADEMIES.

LONDON.

Royal Society, Received September 28.—"Researches on Explosives." Part iii. Supplementary Note. By Sir Andrew **Noble,** Bart., K.C.B., F.R.S.

Since communicating to the Royal Society "Researches on Explosives," part iii., the author has succeeded in obtaining the paper (*Preuss. Akad. Wiss. Berlin Sitz. Ber.*, vol. v. p. 175) by Messrs. Holborn and Austin on the "Specific Heat of Gases at High Temperatures."

The attention of these investigators has been specially directed to carbonic anhydride, and their researches show a considerable (but rapidly decreasing) increment in the specific heat of CO_2 with increase of temperature.

If we suppose the same law of increment which appears to rule up to 800° C. to remain unaltered up to 1300° C., the increments at that temperature would vanish, and, if this be so, the author finds that the specific heat of CO_2, at constant volume, should be taken at 0·2111.

He has therefore re-calculated the specific heats given in his recent paper, and as the specific heats of the exploded gases at constant volume are reduced, the temperatures of explosion given in his paper should also be reduced.

The temperatures the author gives have been obtained by two different methods, firstly, by dividing the heats determined by the calorimeter by the specific heats, and, secondly, by using the equation of dilatibility of gases, and determining the temperature from

$$t = p - p_0 / 0{\cdot}00367 p_0 \qquad (1)$$

where p is the pressure in atmospheres obtained from the explosion, and p_0 the pressure in atmospheres when the volume of gases generated is reduced to 0° C. and 760 mm. bar. pressure.

The differences of the results are very remarkable.

Taking, for example, cordite as an illustration, it will be seen that for the four highest densities given the temperatures derived from the two methods are but slightly different. At the higher density (0·5) the temperatures are 5275° C. and 5263° C., the higher being that derived from equation (1); at density 0·45 the temperatures from the two methods are identical, at density 0·40 the temperatures are 4902° C. and 4970° C., the lower temperature being from equation (1), but after density 0·35 the temperatures derived from equation (1) fall very rapidly.

The same general results are observable in the other two explosives experimented with, and it should be noted that in all three explosives, at the highest densities, the temperatures given by equation (1) are greater than those obtained by the second method.

The figures for the three explosives are given below, the temperatures obtained from $\frac{\text{units of heat}}{\text{specific heats}}$ [1] being given in italics.

Cordite.

D=0·50	D=0·45	D=0·40	D=0·35	D=0·30	D=0·25
5275°	5090°	4902°	4710°	4480°	4165°
5263	*5090*	*4970*	*4860*	*4800*	*4770*

D=0·20	D=0·15	D=0·10	D=0·05
3838°	3490°	3140°	2775°
4760	*4760*	*4790*	*4800*

M.D.

D=0·45	D=0·40	D=0·35	D=0·30	D=0 25	D=0·20
4713°	4494°	4200°	3920°	3585°	3240°
4624	*4411*	*4215*	*4070*	*3945*	*3870*

D=0·15	D=0·10	D=0·05
2890°	2530°	2160°
3840	*3830*	*3860*

[1] Water gaseous.

Nitrocellulose.

D=0·45	D=0·40	D=0·35	D=0·30	D=0·25	D=0·20
4305°	4007°	3630°	3320°	3060°	2835°
3954	*3890*	*3795*	*3670*	*3530*	*3425*

D=0·15	D=0·10	D=0·05
2680°	2520°	2400°
3345	*3295*	*3255*

If these figures be examined, it will be noted that in each explosive at the higher densities the temperatures obtained by the two methods are nearly identical, those determined from equation (1) being the higher, but as the density of charge is decreased the difference at the very low densities is remarkable; some of this difference is doubtless attributable to the slow burning under feeble pressures, and to the rapid cooling, by communication of heat to the walls of the explosive vessel during the ignition of the charge, but it is impossible to ascribe the whole difference to this cause, and the author can only suggest that the explanation is to be sought in the probable dissociation of the carbonic anhydride and aqueous vapour at low pressures, this dissociation being prevented wholly or partially by the very high pressures at the higher densities.

Various substances such as carbon, metallic platinum, tantalum, osmium, and titanium have been placed in the charge, and all have been more or less fused and volatilised during the small fraction of a second to which they were exposed to the maximum heat.

A great part of the titanium was recovered in a fused crystalline condition.

Osmium and thin platinum foil were volatilised, and thick sheet platinum was recovered in the form of a button.

Received October 6.—"On the Isolation of the Infecting Organism ('Zoochlorella') of *Convoluta roscoffensis*." By F. **Keeble** and Dr. F. W. **Gamble.** Communicated by Prof. S. J. Hickson, F.R.S.

The authors have obtained experimental proof that the green cells (Zoochlorellæ) which occur in the superficial tissues of the turbellarian *Convoluta roscoffensis* arise in the body as the result of an infection.

Like those of previous investigators (Haberlandt), the authors' attempts to cultivate the green cells isolated from the animal have failed. Indeed, the evidence points to the conclusion that the green cells, once having entered into the body of the animal, lose all power of separate existence. Therefore, in order to solve the problem of the nature of the green cells, the authors were compelled to attack it at the other end, viz. to attempt to discover the organism *before* its entrance into the body.

From their observations on the normal course of appearance of the green cells in the bodies of just-hatched Convoluta, the authors were led to expect that the precursors of the green cells would be discovered on or in the capsules in which the eggs of Convoluta are laid. This proved to be the case. By the isolation of such capsules green colonies of a motile organism were obtained, and the organism was proved to have the power of infecting young, colourless Convolutas, hatched under sterile conditions, and of giving rise in these animals to green cells identical with those which occur in the normal adult.

The infecting organism is in its active state a unicellular four-ciliate alga. It has a single basin-shaped chloroplast occupying the greater part of the cell, an eccentrically placed plate-like eye spot, and a large octagonal pyrenoid at the posterior end of the body. The motile cells frequently come to rest and surround themselves with a thick striated wall. They may also in this resting stage undergo vegetative division, giving rise to a "palmella" condition.

These characters point to the membership of the infecting organism with the Chlamydomonadineæ.

Faraday Society, October 31.—Lord Kelvin, president, in the chair.—Alternate current electrolysis: Prof. E. **Wilson.** Experiments (*Roy. Soc. Proc.*, vol. liv. p. 407) made with platinum plates in dilute sulphuric acid show that of the total energy supplied to the cell in a given time, more is returned to the source when the frequency is high than when it is low, the maximum coulombs being of the order 0·0006 per sq. cm. in each case. If the quantity of electricity be plotted coordinately with the E.M.F. of electrolysis it is found that at the higher frequency, for about the same maximum coulombs, the curve has relatively a smaller area, such reduction being probably brought about by the greater reversibility. An experiment made at an intermediate frequency when the maximum coulombs were 0·0000023 per sq. cm. gave a still higher value for the proportion of the total energy which is returned to the source, demonstrating that the magnitude of the maximum coulombs has an important effect. When a metal is dissolved in an electrolyte by alternate-current electrolysis, the amount dissolved in a given time at a given current density is smaller at high than at low frequency. Besides this chief conclusion there are indications of other important effects. A complete investigation would need to take accounts of the density and temperature of the electrolyte, and possibly of other conditions.—Alternate current electrolysis as shown by oscillograph records: W. R. **Cooper.** Although polarisation is of the nature of capacity in an alternate current circuit, there is a considerable difference. What might be termed the E.M.F. of a condenser rises and falls as rapidly as the applied pressure, but although the E.M.F. of polarisation may rise as rapidly as the applied pressure, it falls more slowly, with the result that under suitable conditions the current curve may depart very considerably from the sine form. Actual oscillograph records are reproduced in support of this view. In considering the subject it has been very generally assumed that the current follows a sine curve. Since the curve obtained depends very much on the conditions of the experiment, it is necessary to define the conditions very carefully before conclusions can be drawn from different experiments. Oscillograph records of electrolytic rectification were also shown.—Note on the crystalline structure of electro-deposited copper: Prof. A. K. **Huntington.** In Mr. Cowper-Coles's process for making copper wire electrolytically a spiral scratch or groove on the mandril causes the copper deposited on it to part so easily that a long ribbon can be obtained. The author's explanation is that the direction of the lines of crystallisation of an electro-deposited metal is the same as in a casting made on surfaces having the same inclination, *i.e.* the crystals form at right angles to the surface on which the deposit or the casting is made.—Some observations respecting the relation of stability to electrochemical efficiency in hypochlorite production: W. P. **Digby.** The author commenced by directing attention to the fact that in all electrolytic methods of producing hypochlorite solutions, only a small portion, rarely more than 18 per cent., of the chlorine usually present in the form of chloride is converted into hypochlorite; and he suggested that the amount of available chlorine produced from a sodium chloride solution depends upon the relation which the amount of unconverted sodium chloride actually present between the electrodes bears to the current density.

Entomological Society, November 1.—Mr. F. Merrifield, president, in the chair.—*Exhibitions.*—(1) *Panurgus morricei*, Friese, a species of bee new to science taken near Gibraltar, of which it was remarkable that, whereas the species of this genus are wholly black, in this species the ♂ face entirely, and the ♀ partly, was bright yellow, the legs partly yellow, and the abdomen spotted down each side, somewhat as in Anthidium; and (2) the unique type specimen of *Eriades fasciatus*, Friese, a ♂ of the Chelostoma group taken at Jericho in 1899, in which again, while all its congeners are practically unicolorous, the abdomen is brightly banded like a wasp: Rev. F. D. **Morice.** A discussion followed as to the reason of the peculiar coloration in the species under review, the exhibitor pointing out that the colour mimicry in this species could not be due to parasitism, both Panurgus and Eriades being industrious genera.—A ♂ specimen of the earwig *Forficula auricularia* taken at Warwick in September last, with a drawing of the cerci (forceps), which were very abnormal, the broader basal part of the two appearing to be more or less fused together, while the legs of the forceps also were jointed to the basal part: W. J. **Lucas.**—Various interesting insects from Guatemala recently received from Señor Rodriguez, including *Heterosternus rodriguezi*, Cand., *Pantodinus klugi*, Burm., *Plusiotis adelaida*, Hope, and a species of Orthopteron greatly resembling a dead withered leaf, possibly a new species of Mimetica: G. C. **Champion.**—Two species of Coleoptera new to the British

Islands, *Loemophilus monilis*, F., taken in the neighbourhood of Streatley, Berks, and *Dacne fowleri*, n.sp., from Bradfield, with specimens of *D. humeralis* and *D. rufifrons* for comparison: Norman H. **Joy.**—A specimen of a new Agathidium discovered last year in Cumberland, and now taken by the exhibitor in Durham, and a series of *Prionocyphon serricornis* from the New Forest with a drawing of the larva, which he had found under water in the boles of trees, but appeared to emerge for pupation and descend into the ground: H. St. J. **Donisthorpe.**—Preparations of the scents of some African butterflies collected with the assistance of Dr. G. B. Longstaff during the recent visit of the British Association, together with examples of the species investigated: Dr. F. A. **Dixey.**—*Papers.*—A contribution towards the knowledge of African Rhopalocera: P. I. **Lathy.**—A new species of the hymenopterous genus Megalyra, Westwood: J. Chester **Bradley,** Ithaca, N.Y., U.S.A.

Linnean Society, November 2.—Prof. W. A. Herdman, F.R.S., president, in the chair.—Exhibition of the tails of trout and grayling to show the heterocercal origin of the homocercal tail, by means of the hypural bones which balance the vertebra turning upward towards the upper lobe: Rev. G. **Henslow.**—Plant œcology, interpreted by direct response to the conditions of life: Rev. G. **Henslow.** Plant geography and plant surveying—that is, phytotopography—comprise records of the fluctuating distribution of species within definite areas, and associations, the result of natural selection. Œcology proper, or the physiology of plant geography, imply what has been defined by Prof. Tansley as "the study of the vital relations of organisms to their environment." These include the origin of adaptive structures, as varietal, specific, and generic characters, by means of the protoplasmic response to what was formulated by Darwin as "the direct action of the conditions of life, leading to definite results, whereby new subvarieties arise without the aid of natural selection."

Royal Microscopical Society, November 15.—Mr. G. C. Karop, vice-president, in the chair.—Lucernal and solar microscopes by Adams presented to the society: W. E. **Baxter.**—Focusing magnifier made by Messrs. Taylor, Taylor and Hobson: Dr. **Hebb.** The magnifier was a small photographic auxiliary intended for focusing purposes, being placed against the ground-glass screen of the camera to magnify the image and examine its definition.—A new turntable invention: A. **Flatters** and W. **Bradley.** The turntable was driven by clockwork, and was designed for turning oval cells and ringing oval mounts of any proportions from 0″ to $3'' \times 1\frac{1}{4}''$. By the use of the instrument it was also possible to run a ring round a needle point, strike a straight line, or turn circles.—Exhibition of dissections of the tsetse-fly and its trypanosomes: W. **Baker.** Mr. Baker said that, in addition to the slides illustrating the anatomy of the tsetse-fly, there was a specimen of the larva of Ochromyia, also from Africa, together with the perfect insect. The larva lives in the sandy earth, and attaches itself to the flesh and sucks the blood of the natives, causing very troublesome wounds. There was likewise a specimen of the ova of *Schistosoma sinensis* found in the body of a Chinaman who died at Singapore.

Chemical Society, November 16.—Prof. R. Meldola, F.R.S., president, in the chair.—Condensation of ketones with mercury cyanide: J. E. **Marsh** and R. De Jersey **Fleming-Struthers.** Acetone added to a solution of mercury cyanide in aqueous caustic soda gives a white precipitate, $Hg_3C_5H_2ON_2$, which dissolves on further addition of acetone. The reaction forms a good test for acetone applicable in presence of alcohol. The reaction appears to be confined to ketones containing the group $.CO.CH_3$.—Silicon researches, part ix., bromination of silicophenylimide and -amide, and formation of a compound including the group (SiN): J. E. **Reynolds.** Silicotetraphenylamide interacts quite regularly with about six atomic proportions of bromine in benzene. In the first stage bromine removes one of the aniline residues, and there remains a substituted guanidine in solution. This is then attacked with the formation of a soluble di-substituted di-imide. The substituted di-imide finally reacts with one molecular proportion of bromine, giving the compound $SiN.C_6H_3Br_2$.—Application of the microscopic method of molecular weight determination to solvents of high boiling point: G. **Barger** and A. J. **Ewins.** The apparatus used with low boiling solvents is modified by the addition of a "hot stage," whereby the tubes can be maintained at about 90° C.—Green compounds of cobalt produced by oxidising agents: R. G. **Durrant.** The conclusions arrived at are that these substances most probably all contain the nucleus $=Co.O.Co=$, on the persistence of which depends the green colour.—Dunstan, Jowett and Goulding's paper on "the rusting of iron": E. **Divers.** The author rejects the "hydrogen peroxide" theory of rusting advanced by Dunstan and his collaborators, and suggests instead that the active agents are the oxygen and the hydroxyl ions present in the water, the action being represented thus, $(O_2+2H.HO)+4Fe+2O_2=4HO.Fe:O$. In reply, Prof. Dunstan pointed out that the view expressed by Dr. Divers is not intelligible unless it amounts to what is virtually the hydrogen peroxide theory, which accounts for the inhibiting effect of potassium dichromate, as well as of alkalis, on the formation of iron rust in presence of water and oxygen.—Researches on the freezing points of binary mixtures of organic substances; the behaviour of the dihydric phenols towards *p*-toluidine, α-naphthylamine, and picric acid: J. C. **Philip** and S. H. **Smith.** The freezing-point curves indicate the existence of several new compounds of the above substances. These are shortly described.—Synthesis of tertiary menthol and of inactive menthene: W. H. **Perkin,** jun.—The synthetical formation of bridged rings, part ii., some derivatives of di*cyclo*-butane: W. H. **Perkin,** jun., and J. L. **Simonsen.**—Optically active reduced naphthoic acids, part i., dextro-$\Delta^{2(or\ 3)}$-dihydro-1-naphthoic acid: R. H. **Pickard** and A. **Neville.**—Hydrizino-halides derived from oxalic acid: D. A. **Bowack** and A. **Lapworth.**—The action of nitrogen sulphide on organic substances, part iii.: O. C. M. **Davis.** The investigation of the action of nitrogen sulphide on the aldehydes has been continued, and it has been found that the reaction is not so general as was expected.—The action of nitrogen sulphide on organic substances, part iv.: F. E. **Francis.** Nitrogen sulphide acts on acetic and propionic acids at their boiling points with the liberation of sulphur dioxide and smaller quantities of nitrogen, and the formation of the corresponding amides and di-amides.—Tetrazoline, part iii.: S. **Ruhemann** and R. W. **Merriman.**

CAMBRIDGE.

Philosophical Society, October 30.—Prof. Marshall Ward, president, in the chair.—On a well-sinking at Graveley, near Huntingdon: Rev. O. **Fisher.** Graveley is in an extreme western corner of Cambridgeshire. The well is 154 feet above O.D. It was begun in the spring of 1905 in Boulder-clay, which proved to be 50 feet thick. The Oxford-clay was then encountered and pierced through 252 feet. A bed of Oolitic Limestone was next met with, and punched through a foot and a half. Another foot of clay brought the auger to a second bed of rock, and no supply of water having been obtained, the work was abandoned.—On a portable gold-leaf electrometer for low or high potentials, and its application to measurements in atmospheric electricity: C. T. R. **Wilson.** The electrometer has an outer and an inner case; the latter is maintained by means of a quartz Leyden jar at a positive potential which gives a convenient deflection when the gold leaf is earthed; about 60 volts is generally convenient. If the potential of the inner case is called V, then the instrument is suitable for measuring potentials, positive or negative, in the neighbourhood of zero, and also positive potentials differing by not more than a few volts from 2V. The displacement of the leaf for a change of potential of 1 volt is the same in either case. For convenience in charging the gold leaf to any desired potential, and for other purposes, there is attached to the instrument a small cylindrical condenser of variable capacity, consisting of a sliding tube kept at a constant negative potential by means of a quartz Leyden jar and a rod concentric with the tube fixed to the terminal of the gold leaf. The instrument may be applied to the study of the atmospheric potential gradient at the earth's surface and the earth-air current.

—Contributions to the knowledge of the tetrazoline group: S. **Ruhemann** and R. W. **Merriman.** The authors have continued the study of tetrazoline (see *Trans. Chem. Soc.*, 1902, lxxxi., 261) especially with the view of determining the constitution of the two compounds (previously described) which are formed by the action of methyl iodide on tetrazoline. They show that the one substance, $C_3H_7N_4I_3$, is the additive compound of the other, $C_3H_7N_4I$, and point out the resemblance between the former compound and the additive product of diazobenzene chloride with iodine.—The action of radium and other salts on gelatin: W. A. D. **Rudge.** The author has made experiments with various metallic salts, and finds that those of barium, lead, and strontium produce effects upon sterilised gelatin exactly similar to that caused by radium preparations, and comes to the conclusion that the "growth" observed is not of vital origin, and that the effect obtained by the radium salt is probably due to the large proportion of barium which it usually contains.—A suggestion as to the nature of the "walnut" comb in fowls: W. **Bateson** and R. C. **Punnett.**—The absence of isomerism in substituted ammonium compounds: H. O. **Jones.**

EDINBURGH.

Royal Society, November 6.—Prof. Crum Brown, vice-president, in the chair.—The conductivity of concentrated aqueous solutions of electrolytes, part i.: Prof. J. **Gibson.** When the ratio of the specific conductivity to the concentration measured in grams equivalent per cubic centimetre was plotted against the concentration, curves were obtained concave upwards. When, however, the concentration was measured in grams equivalent per gram, the corresponding graphs became in many cases accurate straight lines, and in most others straight lines over a considerable range of concentration. The point of maximum conductivity, when determinable, lay within this straight line portion. There were a few exceptions to the rules just stated. For example, the graph for zinc chloride was nowhere straight, but was concave upward.—The Tarpan and its relationship with wild and domestic horses: Prof. **Ewart.** The paper was a contribution to the important and difficult question of the ancestry of our domestic breeds of horses. The Tarpan, first described by Gmelin about 1740, had usually been considered as the wild ancestor of the horses of Europe; Dr. Nehring regarded it as the last survivor of the prehistoric European horse, modified by infusion of domestic blood, while Pallas and others thought it might very well be the offspring of escaped domestic horses. After a comparison of the characteristics as to hair, tail, mane, and skeleton of Tarpan and other breeds, Prof. Ewart proceeded to describe the result of his recent experiments on cross-breeding. Bearing in mind the fact established by previous experiments, that the crossing of carefully selected forms sometimes reproduced remote types in all their original purity, he selected a Shetland pony mare which seemed to be a blend of at least three varieties, resembling the wild horse of the Gobi Desert in the head, the forest variety in the mane, tail, and trunk, and the Celtic pony in the limbs and hoofs. This mare was crossed with a black Welsh pony. The first foal failed to throw any light on the question, but the second foal had developed into an animal, now three years old, which was as typical a Tarpan as ever roamed the Russian steppes. The general conclusion was that the Tarpan, once so common in the east of Europe, could not be considered as a true wild species, but was very probably derived from at least three sources:—(1) from a variety of Celtic pony; (2) from a variety resembling the forest horse (*Equus caballus typicus*); (3) from a variety identical with, or closely related to, the wild horse of Central Asia (*E. caballus prjevalskii*).—The horse in Norway: Dr. F. H. A. **Marshall.** The horses in Norway belonged to two distinct types, represented by the pure fjord horse and the Gudbrandsdal horse. The former was probably by origin identical with Prof. Ewart's "Celtic pony," while the latter belonged to the forest or cart-horse type. The fjord horse was now, as formerly, typically light dun in colour. The Gudbrandsdal was formerly of almost the same colour, but it was now generally dark brown or black, owing to an infusion of Danish and other foreign blood. The two types of Icelandic horses were derived respectively from the ancestors of the fjord horse and of the Gudbrandsdal horse.—Elimination in the case of equality of fractions whose numerators and denominators are linear functions of the variables: Dr. Thomas **Muir.** The investigation led with great ease to an interesting identity between a determinant of the $(n+1)$th order the constituents of which were determinants of the nth order and one of the nth order the constituents of which were of the $(n+1)$th order, an identity which would be difficult to establish directly.

PARIS.

Academy of Sciences, November 20.—M. Troost in the chair.—Researches on the insoluble alkaline compounds contained in living plant tissues: M. **Berthelot.**—On the Thalassinidæ collected by the *Blake* in the Gulf of Mexico: E. L. **Bouvier.** This group of crustaceans occupies an important place in the deep-sea collections made by the *Blake* expedition. Several new species are described.—On the attitudes of some Tertiary animals of Patagonia: Albert **Gaudry.**—The evolution of terrestrial relief: A. **de Lapparent.**—On the impossibility of negative waves of shock in gases: P. **Duhem.** Remarks on a paper on the same subject by M. G. Zemplén.—On the grains of Sphenopteris: M. **Grand'Eury.**—On the observation of the total eclipse of the sun of August 30, 1905, at Alcosebre, Spain: G. **Millochau.** A *résumé* of results obtained with the telespectrograph.—Interpolation formulæ for continuous periodic functions: Maurice **Fréchet.**—On the development in continued fractions of the function $(F(h, 1, h', u)$, and the generalisation of the theory of spherical functions: H. **Padé.**—On a theorem of M. Poincaré relating to the motion of a heavy solid: Édouard **Husson.** A new demonstration of this theorem is given.—On the application of the partial liquefaction of air with a view to the complete separation of the air into pure oxygen and nitrogen: Georges **Claude.** Details are given of a system of fractional distillation of liquid air. From 100 parts of air, about 14 parts of pure oxygen are obtained by the process originally described by the author. The improvements in the apparatus now described permit of a practically complete separation of the two gases.—The density of nitric oxide; the atomic weight of nitrogen: P. A. **Guye** and Ch. **Davila.** The nitric oxide used in these experiments was prepared by three methods, the action of mercury upon sulphuric acid containing nitrous fumes, the reduction of nitric acid by ferrous sulphate, and the decomposition of sodium nitrite by sulphuric acid in dilute solution. The gas was dried by sulphuric acid and phosphoric anhydride, solidified in liquid air, and purified by fractional distillation. The mean density found was 1·3402 grams per litre, practically identical with the value recently found by Gray—1·3402. This leads to a value for the atomic weight of nitrogen between the limits 14·006 and 14·010, a confirmation of the number 14·009 found in previous researches.—The action of chloride of silicon on iron: Em. **Vigouroux.** Silicon chloride is decomposed by iron a little below a red heat. No lower chloride of silicon appears to be formed, the silicon set free forming an alloy with the iron containing about 20 per cent. of Si, corresponding to the formation of the well known compound Fe_2Si.—On the preparation of racemic amyl alcohol: P. **Freundler** and E. **Damond.** The alcohol is prepared by the interaction of trioxymethylene with the magnesium compound of secondary butyl bromide, details being given of the precautions necessary to obtain a good yield.—The diffusion of barium and strontium in the sedimentary strata: L. **Collot.**—On the increase in the dry weight of green plants developed in the light, in the absence of carbon dioxide, in a soil to which amides have been added: Jules **Lefèvre.** It has been shown experimentally that the growth of green plants in a soil containing amides, and in the absence of carbon dioxide, is accompanied by a rapid increase in the dry weight. The growth under these conditions is therefore real, and not merely a phenomenon of hydration.—On the structure and evolution of *Rhacodium cellare*: F. **Guéguen.**—On juglone: M. **Brissemoret** and R. **Combes.** Contrary to the usually accepted view, it is shown that juglone exists already formed in all the green organs of the walnut (leaves, stem, nut). The method used for the extraction is given in detail.—Rheotropism in some hydroids and Bugula: Paul

Hallez.—The influence of high altitudes on the general nutrition: H. **Guillemard** and R. **Moog.** The observations were carried out at Paris, at the Grand Mulets (3050 metres), and the summit of Mt. Blanc (4810 metres), the changes in the urine being more specially examined. It was found that the effect of high altitudes on nutrition was to produce a diminution of the oxidation processes, diminution of diuresis, and retention of the fixed elements. —The spleen and the biliary secretion: N. C. **Paulesco.** Experiments on dogs leads to the conclusion that the spleen exercises no apparent influence on the formation of bile. —Researches on the formation of hæmoglobin in the embryo: L. **Hugounenq** and Albert **Morel.**—The aurora borealis of November 15 and the magnetic disturbances of November 12 and 15: Th. **Moureaux.** The appearance of the aurora corresponded to strong magnetic disturbances. —Observations on atmospheric electricity in Grahamsland: J. **Rey.**

DIARY OF SOCIETIES.

FRIDAY, DECEMBER 1.

INSTITUTION OF CIVIL ENGINEERS, at 8.—An Installation for the Bacterial Treatment of Sewage, at Neath: W. L. Jenkins.

GEOLOGISTS' ASSOCIATION, at 8.—*Gazella Daviesii*—A New Antelope from the Norwich Crag of Bramerton: M. A. C. Hinton.—On Sections of the Holocene Alluvium of the Thames at Staines and Wargrave: A. S. Kennard and B. B. Woodward.

MONDAY, DECEMBER 4.

ROYAL GEOGRAPHICAL SOCIETY, at 8.30.—Exploration in the Abai Basin, Abyssinia: H. Weld Blundell.

SOCIETY OF CHEMICAL INDUSTRY, at 8.—Notes on Gutta Percha and Balata: Dr. W. A. Caspari.—The Determination of Zinc in Zinc-Aluminium Alloys: Dr. R. Seligman and F. J. Willott.—Distilled Water Supply for "Works" Laboratories: Dr. R. Seligman.—The Estimation of Naphthalene in Coal Gas: C. J. Dickinson-Gair.—Salts of the Alkaloid Cinchonamine: B. F. Howard and F. Perry.

SOCIETY OF ARTS, at 8.—The Measurement of High Frequency Currents and Electric Waves: Prof. J. A. Fleming, F.R.S.

TUESDAY, DECEMBER 5.

INSTITUTION OF CIVIL ENGINEERS, at 8.—The Steam-Turbine: Hon. C. A. Parsons, C.B., F.R.S., and G. G. Stoney.

WEDNESDAY, DECEMBER 6.

GEOLOGICAL SOCIETY, at 8.—The Physical History of the Great Pleistocene Lake of Portugal: Prof. E. Hull, F.R.S.—The Geological Structure of the Sgurr of Eigg: A. Harker, F.R.S.—The Buttermere and Ennerdale Granophyre: R. H. Rastall.

ENTOMOLOGICAL SOCIETY, at 8.—Descriptions of new Genera and Species of African Galerucidæ and Halticidæ: M. Jacoby.

SOCIETY OF ARTS, at 8.—The Manufacture of Sugar from British-grown Beet: Sigmund Stein.

SOCIETY OF PUBLIC ANALYSTS, at 8.—The Reducing Action of Hydrogen, II., The Estimation of Traces of Arsenic by the Marsh-Berzelius Method, and the "Insensitiveness" of Zinc: A. C. Chapman and H. D. Law.—Note on the Removal of Arsenic from Hydrochloric Acid for Use in the Marsh-Berzelius Method: A. R. Ling and T. Rendle.—Note on Dutch Cheese: C. H. Cribb.—Improved Arrangement of Lenses for Reading Balance Graduations: G. T. Holloway.

THURSDAY, DECEMBER 7.

ROYAL SOCIETY, at 4.30.—The Periodogram and its Optical Analogy; with an Illustration from a Discussion of Observations of Sun-spots: Prof. A. Schuster, F.R.S.—(1) On a Property which holds good for all Groupings of a Normal Distribution of Frequency for two Variables, with Applications to the Study of Contingency-tables for the Inheritance of Unmeasured Qualities; (2) On the Influence of Bias and of Personal Equation in Statistics of Ill-defined Qualities: an Experimental Study: G. Udny Yule.—On the Inheritance of Coat-colour in Horses: C. C. Hurst.—A Biometrical Study of Conjugation in Paramæcium: Dr. Raymond Pearl.—On Mathematical Concepts of the Material World: A. N. Whitehead, F.R.S.—The Determination of the Osmotic Pressure of Solutions by the Measurement of their Vapour Pressures: The Earl of Berkeley and E. G. Hartley.—The Vertical Temperature Gradients on the West Coast of Scotland and at Oxshott, Surrey: W. H. Dines, F.R.S. —The Combination of Hydrogen and Oxygen in contact with Hot Surfaces: Dr. W. A. Bone, F.R.S., and R. V. Wheeler.

SOCIETY OF ARTS, at 4.30.—The Partition of Bengal: Sir James A. Bourdillon, K.C.S.I.

CHEMICAL SOCIETY, at 8.30.—The Constitution of Nitrites, Part I., Two Varieties of Silver Nitrite: P. C. Ray and A. C. Ganguli.—The Products of Heating Silver Nitrite: E. Divers.—Ethyl Piperonylacetate: W. H. Perkin, Jun., and R. Robinson.—A Contribution to the Chemistry of Saccharin: F. D. Chattaway.—The Action of Heat on α-Hydrocarboxylic Acids, Part II.: H. R. Le Sueur.—Studies on Optically Active Carbimides, Part II., The Reactions between l-Menthylcarbimide and Alcohols: R. H. Pickard, W. O. Littlebury, and A. Neville.—The Action of Ultra-violet Light on Moist and Dried Mixtures of Carbon Monoxide and Oxygen: S. Chadwick, J. E. Ramsbottom and D. L. Chapman.

INSTITUTION OF ELECTRICAL ENGINEERS, at 8.—The Charing Cross Company's City of London Works: W. H. Patchell.

CIVIL AND MECHANICAL ENGINEERS' SOCIETY, at 8.—Concrete Mixers: Dr. J. S. Owens.

LINNEAN SOCIETY, at 8.—On the Ætiology of Leprosy: Dr. Jonathan Hutchinson, F.R.S.:—Some Notes on the Life-history of *Margaritifera Panesene*: A. W. Allen.—*Exhibition*: Photographs of a Luxuriant Specimen of *Shortia uniflora*, in the Rock-garden of Mr. W. T. Hindmarsh, at Alnwick.

FRIDAY, DECEMBER 8.

ROYAL ASTRONOMICAL SOCIETY, at 5.

PHYSICAL SOCIETY, at 8.

MALACOLOGICAL SOCIETY, at 8.—(1) A Revision of the Species of Cyclostomatidæ and Liotiidæ occurring in the Persian Gulf and North Arabian Sea; (2) Description of Two Species of Marine Shells from Ceylon: J. Cosmo Melvill.—A Pteropod Alias: (*a*) C. Hedley. (*b*) E. R. Sykes.—(1) Descriptions of Four new Species of Marine Shells from Ceylon; (2) Description of a new Species of Physa from N.W. Australia: H. B. Preston.—Notes (1) on the Dates of Publication of J. D. Wilhelm Hartmann's "Erd- und Süsswasser-Gasteropoden," 8vo, St. Gallen, 1840; (2) On Some "Feeding Tracks" of Gastropods: (3) On Cement as a Slug-killer: B. B. Woodward.

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SUPPLEMENT